

## TWO NEW BLACKFLY SPECIES OF *SIMULIUM* (*SIMULIUM*) FROM SICHUAN PROVINCE, CHINA (DIPTERA, SIMULIIDAE)

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**Abstract** Two new species, *Simulium* (*Simulium*) *acontum* sp. nov. and *Simulium* (*Simulium*) *lonchatum* sp. nov. are described on the basis of both a dult and immature stages specimens collected from Luding County, Sichuan Province, China. All the type specimens are deposited in the Department of Biology, Guiyang Medical College.

**Key words** Diptera, Simuliidae, *Simulium* (*Simulium*), new species, Sichuan Province.

The present paper reports two new species of the subgenus *Simulium* of the genus *Simulium* Latreille, *S. (S.) acontum* sp. nov. and *S. (S.) lonchatum* sp. nov. The former species evidently falls into the *malyschevi* group and the latter species belongs to the *variegatum* group. They were collected from the upland of Sichuan Province. The morphological descriptions and taxonomic discussions are given below.

### 1 *Simulium* (*Simulium*) *acontum* sp. nov. (Figs. 1-18)

Female. Body length about 2.8 mm. Wing length about 2.6 mm.

Head. Slightly narrower than thorax. Frons and clypeus brownish black, with silvery grey pollinosity and covered with several brown hairs. Frontal ratio 8.5: 6.0: 7.6. Frons-head ratio 8.5: 29.6. Antenna composed of 2+ 9 segments, brownish black except scape pale yellow. Maxillary palp with 5 segments in proportion of 1.9: 2.0: 5.7: 4.4: 10.6; sensory vesicle elliptical about twice as long as width and about 1/3 as long as 3rd segment. Maxilla with 14 inner teeth and 16 outer ones. Mandible with about 33 inner and 16 outer teeth. Cibarium armed with a group of minute denticles.

Thorax. Scutum brownish black, covered with dense, recumbent, golden pubescence and intermixed with erect long black hairs on prescutellar area; when viewed in certain angle of light, silvery grey spots present similar to those in the preceding species, consisting of a pair of anterior spots moderately separated in the lateral and posterior ones. Scutellum brownish black, grey-dusted and with sparse, erect black hairs. Postscutellum brown, silvery grey dusted and bare. Pleural

membrane and katepisternum bare. Legs. Fore coxa yellow. Mid and hind ones brown. Fore and hind trochanters yellow, mid trochanter dark brown. Fore femur yellow except distal 1/4 brownish black; mid and hind femora yellow at base, gradually becoming dark distally and brownish black on distal 1/3. Fore tibia brownish black on basal 1/4, distal 1/5 and median large portion of outer surface which are pale yellow; mid and hind tibiae yellow except distal 1/4 brownish black. All tarsi brownish black except basal 2/3 of mid basitarsus, basal 1/2 of hind basitarsus and basal 1/2 of 2nd tarsomere yellow. Fore basitarsus about 6.0 times as long as wide. Hind basitarsus nearly parallel-sided, about 6.0 times as long as wide. Calcipala and pedisulcus moderately developed. Each claw with small basal tooth. Wing. Costa with spinules as well as hairs. Subcosta hairy. Basal section of radius bare. Base of radius with a tuft of brown hairs.

Abdomen. Basal scale dark brown, with fringe of pale yellow hairs. Terga dark brown. Tergites 5-8 black, shiny and covered with short black hairs. Genitalia. Sternite 8 bare medially and with about 15 hairs on each side. Anterior gonapophyses triangular, membranous, covered with about 10 short setae and numerous microsetae, much produced posteriorly, inner margins widely separated. Genital fork of inverted-Y form; stem slender, well sclerotized; arms slender, each with distinct large projection directed anterodorsally. Paraproct somewhat widened. Cercus rounded posteriorly. Spermatheca nearly globular.

Male. Body length about 3.0 mm. Wing length about 2.8 mm.

Head. As wide as thorax. Upper eye consisting of 15 horizontal rows and 15 vertical columns of large

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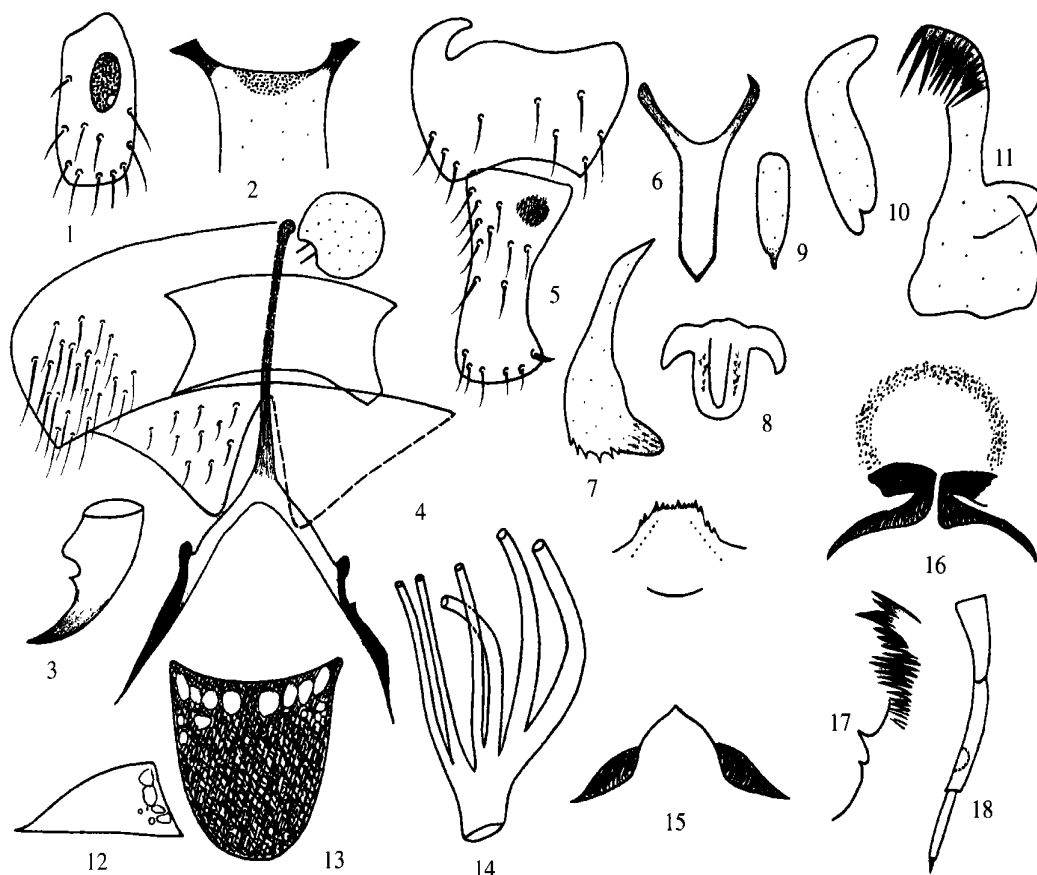
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facets. Clypeus black, whitish grey pruinose covered marginally with long dark hairs. Antenna composed of 2+ 9 segments, brownish black except scape brownish yellow; 1st flagellar segment about 2.0 times as long as the following one. Maxillary palp composed of 5 segments, 3rd segment of normal size, with elliptical serrory vesicle about 0.28 times length of 3rd segment.

Thorax. Scutum dark brown, grey pruinose and with anterior pair of grey white spots on shoulders, which extend along lateral borders. Scutum uniformly covered with golden yellow recumbent pubescence, interspersed with long dark erect hairs on prescutellar area. Rest as in female. Legs. Coloring as in female except mid and hind femora yellow on basal 3/4 and black on distal 1/4; hind tibia brownish black on basal 1/5 and distal 1/5 and median large portion of outer surface which are pale yellow. Fore basitarsus somewhat dilated (W: L ratio 1.0: 7.0). Hind basitarsus somewhat enlarged (W: L ratio 1.0: 4.2). Wing. As in female except subcosta bare.

Abdomen. Basal scale black with a fringe of long brown hairs. Terga dark brown. Genitalia. Coxite short, broader than length. Style appear massive and comparatively very broad, beyond basal 1/3 become slightly narrow and curved inwards distally, and about 2.0 times as long as its greatest width near base, distal end rounded and with apical spine directed inwards; near base, its dorsointernal surface produced into a small protuberance bearing a cluster of strong setae. Ventral plate long, plate shaped, nearly parallel side, tapered distally in ventral view, and having a ventrally produced median process or keel with toothed posterior margins in proximal 1/2; distal 1/2 process lip-like and sparsely setose on outer surface. Basal arms strongly sclerotized and as long as plate body. Parameres large basally and each with numerous parameres hooks. Median sclerite plate-like, parallel-sided and rounded at tip.

Pupa. Body length 2.6 mm.



Figs. 1-18. *Simulium (Simulium) acontum* sp. nov. 1. Female sensory vesicle. 2. Female cibarium. 3. Female claw. 4. Female genitalia. 5. Coxite and style of male. 6. Ventral plate. 7. Ventral plate in lateral view. 8. Ventral plate in end view. 9. Median sclerite. 10. 1st tarsomer of male hind leg. 11. Parameral organ. 12. Cocoon in lateral view. 13. Cocoon in dorsal view. 14. Filaments. 15. Larval head capusules in ventral view. 16. Larval anal sclerite and ring of minute spines. 17. Larval mandible. 18. Larval antenna.

Head and thorax. Integument yellow, lacking any tubercles. Head with 1 longer facial and 2 shorter frontal pairs of simple trichomes; thorax with 4 pairs of simple trichomes. Gill organ. With 6 filaments arranged in pairs and shortly stalked, about 2/5 of length of pupal body; all filaments almost equal in length, but different from another in thickness, the upper pair of filaments thicker somewhat swollen near base and slightly thicker than those of other 2 pairs; all filaments tapered, with numerous transverse and densely covered with minute tubercles on basal section.

Abdomen. Tergum 2 with 5 short spinous setae and a long simple seta on each side; terga 3 and 4 each with 4 hook-like spines directed forward along posterior margin on each side. Tergum 8 with spine comb in transverse row; terga 4-9 lacking comb-like groups of very minute spines; tergum 9 lacking terminal hooks. Sterna 4-9 lacking comb-like groups of very minute spines; sternum 5 with a pair of bifid hooks situated closely together on each side; sterna 6 and 7 each with a pair of inner bifid and outer simple hooks widely spaced on each side. Cocoon. Wall-pocket shaped, tightly woven, with moderately strong anterior margin, specially anteriorly with 4 anterolateral windows and some small perforations, those windows running parallel to anterior border and lying just behind it.

Mature larva. Body about 6.0 mm. Body color pale yellow.

Head. Spots of cephalic apotome merged with darkness of background. Antenna with 4 segments in proportion of 2.1: 5.2: 2.9: 0.3, segment 2 with a pale annulet on distal 1/3. Cephalic fan with 29-36 main rays. Mandible with a large and a small mandibular serration, but lacking any supernumerary teeth. Hypostomium with a row of 9 apical teeth, corner and median teeth moderately developed and intermediate teeth small. Lateral serration present apically. 6-8 hypostomal setae lying subparallel to lateral margin on each side. Postgenal cleft mitre-shaped, parallel sided near basal 1/2, then converging apically and subequal in length to postgenal bridge. Thoracic and abdominal integument bare. Rectal gill lobes compound each with 16-24 finger-like secondary lobules. Anal sclerite X-formed, having broadened wing-like anterior short arms about 0.5 times as long as posterior ones. Ventral papillae absent. Posterior circlet with about 80 rows of approximately 10-12 hooklets per row.

Holotype ♀, reared from pupa, slide mounted, Luding County (29° 39' N, 102° 07' E; 2 070 m),

Sichuan Province, China. 19 Sep. 2003. Paratypes: 6 ♀♀, 8 ♂♂, 16 pupae, 21 larvae, same data as holotype, taken from trailing grasses exposed to the sun by HUANG Li and ZHANG Chur-Lin.

Remarks. This new species seems to fall into the *malyschevi* group in having the unstriated scutum, claws each with a subbasal tooth and the inner margins of anterior gonapophyses widely separated in the female, the usual iridescent scutal pattern and the Y-formed ventral plate with serrate posterior margins in the male, the 6-filamented gill and the simple, wall-pocket shaped with anterolateral windows in the pupa.

The new species is very characteristic in the shape of male ventral plate and pupal cocoon; the male hind basitarsus somewhat enlarged; the pupal integument lacking tubercles and filaments in thickness from dorsal to ventral; the larval postgenal cleft mitre-shaped and anal sclerite with broadened wing-like anterior arms, by which those may be distinguished from all the other known species of *malyschevi* group.

## 2 *Simulium* (*Simulium*) *lonchatum* sp. nov. (Figs. 19-35)

Female. Body length 3.0-3.2 mm. Wing length about 3.0 mm.

Head. Narrower than thorax. Frons and clypeus black with whitish grey pruinose, covered with fine yellowish white pubescence, intermixed with sparse dark hairs. Frontal ratio 9.0: 8.0: 8.0; frons: head ratio 9.0: 33.5. Fronto-ocular area well developed. Antenna composed of 2+ 9 segments, black brown except scape yellow. Maxillary palp with 5 segments in proportion of 1.2: 1.1: 5.9: 6.0: 16.9, 3rd segment normal in shape and with ellipsoidal sensory vesicle which is about 0.3 times length of 3rd segment. Maxilla with 4 inner teeth and 13 outer ones. Mandible with about 34 inner teeth and 14 outer ones. Glibarium armed smooth but with a small median projection.

Thorax. Scutum brownish black, grey pruinose, densely covered with golden yellow recumbent pubescence but unstriated and not patterned. Scutellum brownish black, whitish grey pruinose with fine yellow hairs and long dark hairs. Postscutellum black and bare. Pleural membrane and katapisternum smooth. Legs. Foreleg: coxa and trochanter yellow; femur yellow with distal 1/5 brownish black; tibia yellow with distal 1/4 and basal 4/5 along inner margin dark brown, and median outer portion with white sheen in lights; tarsus black. Midleg: coxa brownish black; trochanter yellow; femur and tibia yellow except distal

1/5 black; tarsus black except basal 1/2 of basitarsus yellow. Hindleg: coxa brownish black, trochanter brown; femur greyish yellow except distal cap brownish black; tibia with basal 1/3 brownish yellow, distal 1/5 black and medium 1/3 with large yellowish patch on outer surface; basitarsus yellow except distal 1/3 black, rest of tarsal segment brownish black except basal 1/3 of 2nd segment white. Fore basitarsus somewhat dilated, W: L= 1.0: 6.5. Hind basitarsus nearly parallel-side, W: L= 1.0: 6.0. Calcipala and pedisulcus well developed. Each claw with a subbasal tooth. Wing: Costa with spinules as well as hairs; subcosta hairy; basal section of radius bare; base of radius with a tuft of black hairs.

Abdomen Basal scale brown, with a fringe of long yellow hairs. Terga black except 2nd segment brownish yellow; tergites 6-8 brownish black, shiny. Genitalia. Sternite 8 bare medially with about 40 long hairs laterally on each side. Anterior gonapophyses membranous, with pointed, bare tip, covered with about 25 macrosetae; inner margins being deeply concave internally, well sclerotized except distal portion; posterior margin rounded. Genital fork with sclerotized slender stem; arms diverged laterally, each with a prominent projection directed forward. Paraproct and cercus of moderate size. Spermatheca elliptic and unpatterned.

Male. Body length about 3.0 mm. Wing length about 3.0 mm.

Head Slightly wider than thorax. Upper eye consisting of 18 horizontal and 12 vertical rows of large facets. Clypeus as in female. Antenna composed of 2+9 segments. 1st flagellomere somewhat elongated, being about 1.7 times as long as following one. Maxillary palp with 5 segments, 3rd segment not enlarged, sensory vesicle small, about 0.24 as long as 3rd segment.

Thorax. Nearly as in female except hind basitarsus somewhat inflated (W: L= 1.0: 4.0) and wing's subcosta bare.

Abdomen. Body length about 3.0 mm. Nearly as in female. Genitalia. Coxite rectangular. Style elongated, nearly 3.0 times as long as its greatest breadth near subbasal and about 1.6 times as long as coxite, spatulate, gently curved inward with subapical spine and with a subbasal protuberance produced dorsomedially, bearing numerous spinules on its surface. Ventral plate roughly Y-shaped, plate body lanciform but distal end rounded, having a ventrally produced median or keel downward with toothed posterior margins in

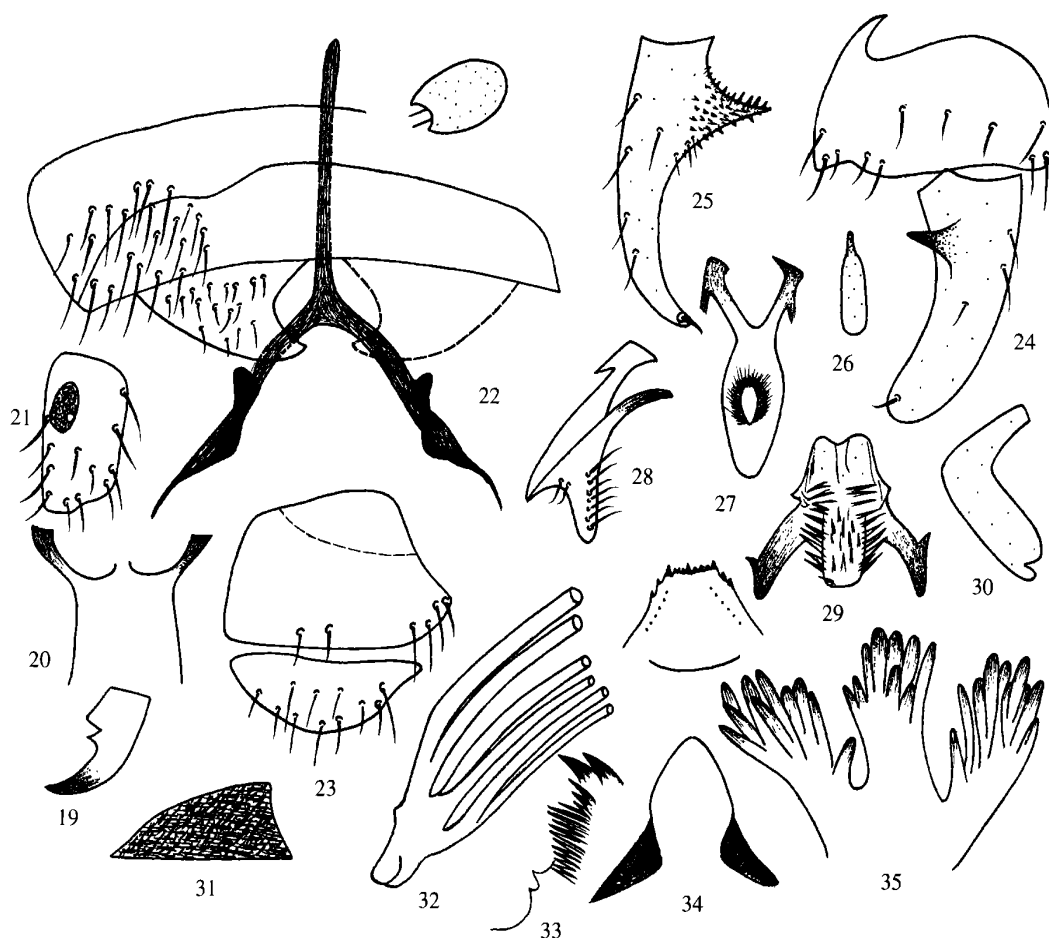
proximal 2/3, distal 1/3 setose process lip like and beyond dentate portion. Basal arms strongly sclerotized and nearly straight apically. Paramere broad basally, tapered toward parameral hooks and consisting of about 15 long parameral hooks and small undeveloped ones. Median sclerite long plate-like, distal 2/3 nearly parallel-side.

Pupa. Body length about 3.2 mm. Body color brownish yellow.

Head and thorax. Integument moderately covered with disc-like tubercles. Head with 1 facial and 2 frontal pairs of simple, short trichomes; thorax with 4 pairs of trichomes, all simple and short. Gill organ. 6-filamented in pairs and running practically parallel to one another. Uppermost filament approximately 1/2 length of pupal body; all filaments subequal in length except uppermost filament a little longer and thicker, gradually tapered toward apex, with annular ridges and densely covered with minute tubercles.

Abdomen. Tergum 1 with 1 simple seta on each side; tergum 2 with 5 simple short spines and 1 long seta. Terga 3 and 4 each with 4 hooked spines along posterior margins on each side. Terga 7 and 8 each with a transverse row of spine combs on each side; terga 6-9 each with comb-like groups of minute spines on each side. Tergum 9 lacking terminal hooks. Sternum 5 with a pair of bifid hooks submedially on each side; each of 6 and 7 with a pair of bifid hooks widely spaced on each side. Sterna 5-8 with comb-like groups of very minute spine scattered all over. Cocoon. Simple, wall-pocket shaped, tightly woven, with a strong anterior margin.

Mature larva. Body length about 6.0 mm; color yellowish brown. Cephalic apotome pale yellow, with faint or indistinct, positive head spots. Antenna composed of 4 segments in proportion of 4.0: 6.5: 4.3: 0.3, 2nd segment with a pale annulet on distal 1/4. Each cephalic fan with 42-45 main rays. Mandible with a large and a small teeth mandibular serration but without supernumerary serrations; comb-teeth decreasing in length from 1st to 3rd. Hypostomium with a row of 9 apical teeth, median and each corner teeth moderately longer than others; lateral serration present apically; 5 hypostomal setae diverging posteriorly from lateral margin on each side. Postgenal cleft deep, subspear-shaped, about 3 times as long as postgenal bridge. Thoracic and abdominal integument bare. Rectal papilla of 3 lobes, each with 9-13 finger-like secondary lobules. Anal sclerite X-formed, anterior arms about 0.6 times as long as posterior ones; ring of



Figs 19-35. *Simulium (Simulium) lonchatum* sp. nov. 19. Female claw. 20. Female cibarium. 21. Female sensory vesicle. 22. Female genitalia. 23. Paraproct and circus. 24. Coxite and style of male. 25. Style in larval view. 26. Median sclerite. 27. Ventral plate. 28. Ventral plate in lateral view. 29. Ventral plate in end view. 30. 1st tarsomer of male hind leg. 31. Cocoon. 32. Filaments. 33. Larval mandible. 34. Larval head capsules in ventral view. 35. Rectal gill lobes.

minute spines round rectal papilla. Posterior circlet with about 84 rows of up to 14 hooklets per row. Verral papillae absent.

Holotype ♀, reared from pupa, slide mounted, was collected from a rapid current from Yaowangmia, Luding County (29°39' N, 102°07' E; 2 050 m), Sichuan Province, China. Paratypes: 6 ♀♀, 2 ♂♂, 8 pupae and 4 larvae, taken from trailing grasses exposed to the sun by HUANG Li and ZHANG Chun Lin on the same day as holotype.

Remarks. The new species belongs to the *variegatum*-group as defined by Rubtsov (1959-1964) in having female claws each with a small subbasal tooth, anterior gonapophyses with their inner margins deeply concave and with tips bare, pointed and convergent. There are some Oriental species which closely resemble this new species, such as *S. (S.) nilgircum* Puri from India, *S. (S.) barnesi* Takaoka and Suzuki and

*S. (S.) chamlongi* Takaoka and Suzuki from Thailand, *S. (S.) hackeri* Edwards from Malaysia, *S. (S.) taiwanicum* Takaoka and *S. (S.) qianense* Chen and Zhang from China. The new species, however, can be readily separated from all the related species mentioned above by several combination characters, such as the pale coloration of the legs and the cibarium smooth in the female; the special shape of ventral plate in the male, the all filaments directed forwards close together and tergum 9 lacking a pair of terminal hooks in the pupa; and the 2nd segment of antenna with pale annulet.

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四川蚋属二新种记述 ( 双翅目, 蚋科)

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摘 要 记述了采自四川省泸定县的蚋属蚋亚属 2 新种, 尖板蚋 *Simulium* (*Simulium*) *acantum* sp. nov. 和矛板蚋 *Simulium* (*Simulium*) *lonchatum* sp. nov. 前者隶属于淡足蚋组 *malyschevi* group, 后者隶属于杂色蚋组 *variegatum*-group, 二者均以雄虫生殖腹板的形态特征命名。模式标本存放于贵阳医学院生物学教研室。

1 尖板蚋, 新种 *Simulium* (*Simulium*) *acantum* sp. nov. (图 1~ 18)

新种依据其雌性盾片无纵纹, 爪具小的亚基齿, 生殖板内缘宽分离和雄性生殖腹板后缘具齿, 蛹呼吸丝 6 条以及茧简单并具前侧窗等特征, 隶属于淡足蚋组 *malyschevi* group。新种又依其雄性生殖腹板和蛹茧的特征: 雄性后足基跗节膨大; 蛹头胸部几乎无疣突; 呼吸丝粗细递减, 幼虫后颊裂箭形, 肛板具宽大的翼状前臂等综合特征, 可与该组已知其它的蚋种区别。

关键词 双翅目, 蚋科, 蚋属, 蚋亚属, 新种, 四川省。  
中图分类号 Q969. 442. 9

正模♀, 副模 6♀♀, 8 ♂♂, 16 蛹, 21 幼虫。采自泸定县药王庙小溪中水草。

2 矛板蚋, 新种 *Simulium* (*Simulium*) *lonchatum* sp. nov. (图 19~ 35)

新种根据其雌爪具亚基齿, 生殖腹板内缘具深凹, 端内角尖、内弯而光裸等特征, 似应隶属于杂色蚋组 *variegatum*-group, 近似于印度的 *S.* (*S.*) *nilgircum*、泰国的 *S.* (*S.*) *barnesi* 和 *S.* (*S.*) *chamlongi*、马来西亚的 *S.* (*S.*) *hackeri* 以及中国的 *S.* (*S.*) *taiwanicum* 和 *S.* (*S.*) *qianense*。但新种依其两性胫节颜色, 雌性食囊光滑, 雄性生殖腹板矛状, 蛹呼吸丝排列呈束发出, 蛹第 9 背板端钩缺如和触角梗节 2 具淡色次生环等综合特征, 可与上述近缘种区别。

正模♀, 副模 6♀♀, 2 ♂♂, 8 蛹, 4 幼虫。采自泸定县药王庙小溪中水草。